

**WHAT IS CLAIMED IS:**

1. A magnetic transducer comprising:
  - a nonmagnetic layer having a pair of facing surfaces;
  - a soft magnetic layer formed on one surface of the nonmagnetic layer;
  - a ferromagnetic layer formed on the other surfaces of the nonmagnetic layer;
  - an antiferromagnetic layer formed on the ferromagnetic layer on the side opposite to the nonmagnetic layer;
    - at least one of a soft magnetic interlayer formed in the soft magnetic layer and a ferromagnetic interlayer formed in the ferromagnetic layer, the soft magnetic interlayer having magnetism and electrical resistance higher than the electrical resistance of the soft magnetic layer, the ferromagnetic interlayer having magnetism and electrical resistance higher than the electrical resistance of the ferromagnetic layer;
    - the soft magnetic interlayer formed in the soft magnetic interlayer; and
    - the ferromagnetic interlayer formed in the ferromagnetic layer.
2. A magnetic transducer according to claim 1, wherein  $0.2T_k \leq D_2 \leq 0.8T_k$ , where  $T_k$  represents the thickness of the ferromagnetic layer and  $D_2$  represents the distance between the nonmagnetic layer and the ferromagnetic interlayer.
3. A magnetic transducer according to claim 1, wherein the distance between the nonmagnetic layer and the ferromagnetic interlayer is from 0.6 nm to 3.6 nm inclusive.
4. A magnetic transducer according to claim 1, wherein the ferromagnetic interlayer contains at least one of oxide, nitride and nitride oxide.
5. A magnetic transducer according to claim 4, wherein the ferromagnetic interlayer contains at least cobalt in a group consisting of nickel, cobalt and iron and at least one kind of element in a group consisting of oxygen and nitrogen.

6. A magnetic transducer according to claim 1, wherein the thickness of the ferromagnetic interlayer is from 0.5 nm to 1.0 nm inclusive.

7. A magnetic transducer according to claim 1, comprising the ferromagnetic interlayer formed in the ferromagnetic layer,

wherein  $0.2T_k \leq D_2 \leq 0.8T_k$ , where  $T_k$  represents the thickness of the ferromagnetic layer and  $D_2$  represents the distance between the nonmagnetic layer and the ferromagnetic interlayer.

8. A magnetic transducer according to claim 7, wherein the ferromagnetic layer contains at least cobalt in a group consisting of cobalt and iron.

9. A magnetic transducer according to claim 7, wherein the ferromagnetic interlayer contains at least one of oxide, nitride and nitride oxide.

10. A magnetic transducer according to claim 9, wherein the ferromagnetic interlayer contains at least cobalt in a group consisting of nickel, cobalt and iron and at least one kind of element in a group consisting of oxygen and nitrogen.

11. A magnetic transducer according to claim 7, wherein the soft magnetic layer has

a first soft magnetic layer containing at least nickel in a group consisting of nickel, cobalt, iron, tantalum, chromium, rhodium, molybdenum and niobium; and  
a second soft magnetic layer containing at least cobalt in a group consisting of nickel, cobalt and iron.

12. A magnetic transducer according to claim 7, wherein the antiferromagnetic layer contains at least one kind of element in a group consisting of platinum, ruthenium, rhodium, palladium, nickel, gold, silver, copper, iridium, chromium and iron and manganese.

13. A magnetic transducer according to claim 7, wherein the nonmagnetic layer contains at least one kind of element in a group consisting of copper, gold and silver.

14. A magnetic transducer according to claim 7, wherein the thickness of the ferromagnetic interlayer is from 0.5 nm to 1 nm inclusive.

15. A magnetic transducer according to claim 1, comprising the ferromagnetic interlayer formed in the ferromagnetic layer,  
wherein the distance between the nonmagnetic layer and the ferromagnetic interlayer is from 0.6 nm to 3.6 nm inclusive.

16. A magnetic transducer according to claim 15, wherein the ferromagnetic layer contains at least cobalt in a group consisting of cobalt and iron.

17. A magnetic transducer according to claim 15, wherein the ferromagnetic interlayer contains at least one of oxide, nitride and nitride oxide.

18. A magnetic transducer according to claim 17, wherein the ferromagnetic interlayer contains at least cobalt in a group consisting of nickel, cobalt and iron and at least one kind of element in a group consisting of oxygen and nitrogen.

19. A magnetic transducer according to claim 15, wherein the soft magnetic layer has

a first soft magnetic layer containing at least nickel in a group consisting of nickel (Ni), cobalt (Co), iron (Fe), tantalum (Ta), chromium (Cr), rhodium (Rb), molybdenum (Mo) and niobium (Nb); and

a second soft magnetic layer containing at least cobalt in a group consisting of nickel, cobalt and iron.

20. A magnetic transducer according to claim 15, wherein the antiferromagnetic layer contains at least one kind of element in a group consisting of platinum, ruthenium, rhodium, palladium, nickel, gold, silver, copper, iridium, chromium and iron and manganese.

21. A magnetic transducer according to claim 15, wherein the nonmagnetic layer contains at least one kind of element in a group consisting of copper, gold and silver.

22. A magnetic transducer according to claim 15, wherein the thickness of the ferromagnetic interlayer is from 0.5 nm to 1 nm inclusive.

23. A thin film magnetic head having a magnetic transducer, the magnetic transducer comprising:

- a nonmagnetic layer having a pair of facing surfaces;
- a soft magnetic layer formed on one surface of the nonmagnetic layer;
- a ferromagnetic layer formed on the other surface of the nonmagnetic layer;
- an antiferromagnetic layer formed on the ferromagnetic layer on the side opposite to the nonmagnetic layer;
- at least one of a soft magnetic interlayer formed in the soft magnetic layer and a ferromagnetic interlayer formed in the ferromagnetic layer, the soft magnetic interlayer having magnetism and electrical resistance higher than the electrical resistance of the soft magnetic layer, the ferromagnetic interlayer having magnetism and electrical resistance higher than the electrical resistance of the ferromagnetic layer;
- the magnetic transducer including the ferromagnetic interlayer formed in the ferromagnetic layer;

wherein  $0.2T_k \leq D_2 \leq 0.8T_k$ , where  $T_k$  represents the thickness of the ferromagnetic layer and  $D_2$  represents the distance between the nonmagnetic layer and the ferromagnetic layer.

24. A thin film magnetic head according to claim 23, wherein the ferromagnetic interlayer contains at least one of oxide, nitride and nitride oxide.

25. A thin film magnetic head according to claim 23, the magnetic transducer comprising the ferromagnetic interlayer formed in the ferromagnetic layer, wherein the distance between the nonmagnetic layer and the ferromagnetic interlayer is from 0.6 nm to 3.6 nm inclusive.

26. A thin film magnetic head according to claim 25, wherein the ferromagnetic interlayer contains at least one of oxide, nitride and nitride oxide.